Table 5										
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10003	12/22/2008	408 gallons	Styrene, water, tri-calcium phosphate, potassium persulfate, and polystyrene	Building 4 concrete emergency containment area	Reactor 15 was releasing material into the building 4 emergency containment area.	Water-blasting work in reactor 15 damaged a recently installed valve seal.	Attempts to stop the release were unsuccessful. For operational and personnel safety, the batch was taken through the react phase, cooled, and then discharged into the building 4 emergency containment area south of Building 4. The seal was replaced.	Pohar and Sons was hired to clean the material out of the containment area.	FHRPRU003237-FHRPRU003239	N/A
29307	2/25/2009	120,000 lbs	Polystyrene, water, and styrene	Building 4 concrete emergency containment area	A batch sample from reactor 16 indicated a batch suspension failure.	Batch suspension failure.	Attempts to regain batch suspension and stabilize reactor temperature were unsuccessful. A partial discharge to the building 4 emergency containment area was done to create additional room for cooling water. The additional cooling water succeeded in stabilizing reactor temperature and the remainder of the batch was able to complete polymerization. Polystyrene was then discharged into the building 4 emergency containment area.	Pohar and Sons was hired to clean the material out of the containment area.	FHRPRU003246-FHRPRU003248	N/A
35284	12/7/2009	120,000 lbs	Polystyrene, water, and styrene	Building 4 concrete emergency containment area	A batch sample from reactor 17 indicated batch suspension failure.	Batch suspension failure due to mineral oil leak in reactor 17 agitator seal	Attempts to regain batch suspension and stabilize reactor temperature were unsuccessful. A partial discharge to the building 4 emergency containment area was done to create additional room for cooling water. The additional cooling water succeeded in stabilizing reactor temperature and the remainder of the batch was able to complete polymerization. Polystyrene was then discharged into the building 4 emergency containment area. Jacket profile alarms were updated in the DCS to indicate large temperature drops in reactor jackets. Reactor 17's agitator seal was replaced.	Pohar and Sons was hired to clean the material out of the containment area.	FHRPRU003253-FHRPRU003257	N/A
44234	11/6/2010	120,000 lbs	Polystyrene, water, and styrene	Building 4 concrete emergency containment area	As a result of an area-wide power outage, the contents of two reactors had to be diverted to the building 4 emergency containment area due to safety concerns.	Area wide power outage.	FHR discharged the contents of two of its reactors into the emergency concrete containment area. This action was necessary to alleviate safety concerns from over-pressurization and structural failure of the reactor vessels at the Facility.	Pohar and Sons was hired to clean the material out of the containment area.	FHRPRU003263-FHRPRU003270	N/A

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							FHR reviewed the plant's incoming power distribution design. Additionally, the Emergency Ameren Dispatch Access procedure was revised to reduce response time during a power outage at the facility.			
49457	5/17/2011	120,000 lbs	Polystyrene, water, and styrene	Building 4 concrete emergency containment area	A batch sample from reactor 17 indicated batch suspension failure.	Batch suspension failure.	Attempts to regain batch suspension and stabilize reactor temperature were unsuccessful. The reactor was placed into emergency cool and was discharged into the building 4 emergency containment area.	Pohar and Sons was hired to clean the material out of the containment area.	FHRPRU003272-FHRPRU003278	N/A
57474	1/13/2012	120,000 lbs	Polystyrene, water, and styrene	Building 4 concrete emergency containment area	Power to reactor 17's agitator was lost, and the batch was discharged into the building 4 concrete emergency containment area.	Loss of power to reactor 17's agitator.	Attempts were made to recover agitation but were unsuccessful. The reactor was discharged into the building 4 emergency containment area.	Pohar and Sons was hired to clean the material out of the containment area.	FHRPRU003294-FHRPRU003294	N/A
62733	5/21/2012	120,000 lbs	Polystyrene, water, and styrene	Building 4 concrete emergency containment area	A batch sample from reactor 17 indicated batch suspension failure. After the batch was discharged, FHR discovered the agitator blades were damaged.	Batch suspension failure and damage to agitator blades.	Attempts were made to recover batch suspension and stabilize reactor temperature but were unsuccessful. The batch was able to complete polymerization. The reactor blades were repaired.	Pohar and Sons was hired to clean the material out of the containment area.	FHRPRU003295-FHRPRU003296	N/A
70338	11/19/2012	120,000 lbs	Polystyrene, water, and styrene	Building 4 concrete emergency containment area	A batch sample from reactor 17 indicated batch suspension failure.	Batch suspension failure.	Attempts were made to recover batch suspension and stabilize reactor temperature but were unsuccessful.	Pohar and Sons was hired to clean the material out of the containment area.	FHRPRU003298-FHRPRU003300	N/A
75643	2/17/2013	120,000 lbs	Polystyrene, water, and styrene	Building 4 concrete emergency containment area	A batch sample from reactor 17 indicated batch suspension failure.	Batch suspension failure.	Attempts were made to recover batch suspension. The batch suspension loss procedure was followed.	Pohar and Sons was hired to clean the material out of the containment area.	FHRPRU003311-FHRPRU003311	N/A
77366	5/1/2013	120,000 lbs	Polystyrene, water, and styrene	Building 4 concrete emergency containment area	A power outage to the facility caused by the third-party power supplier resulted in the loss of temperature control to reactor 14 during the styrene polymerization phase of the process. Without the capability to control the reaction, reactor 14 ran the risk of over pressurization due to the exothermic characteristics of the styrene polymerization process. To reduce the over pressurization risk, FHR discharged the reactor contents to the concrete emergency containment area.	Power outage.	Power was restored to the plant. FHR discovered that the imbalance in the incoming power had caused the control fuses to open on equipment that was running at the time of the power surge. All equipment was repaired.	Pohar and Sons was hired to clean the material out of the containment area.	FHRPRU003496-FHRPRU003496	N/A
90853	4/25/2014	120,000 lbs to concrete containment area	Polystyrene, water, and styrene	Building 4 concrete emergency containment area	FHR's Safety Instrumented System (SIS) was activated on Reactor 17 which automatically opened the discharge valve on Reactor 17 and transferred the batch contents from the reactor into the emergency concrete containment area. A portion of the contents from Reactor 17 (a mixture of	SIS activation.	Attempts were made to cool reactor temperature. The SIS discharge procedure was followed and the building was brought to a safe state. The surrounding area was cleaned. All wastes generated from the	D Construction was hired to clean the material out of the containment area.	FHRPRU003507-FHRPRU004158	Yes

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		2,820 lbs to gravel/asphalt			styrene and water) had discharged to the graveled surface and asphalt adjacent to the emergency containment area. In addition, some discharged material had migrated to a nearby storm sewer drain. All storm sewer block gates were closed to ensure that no discharged material would exit the site through the storm sewer.		event were cleaned up and disposed of. Modifications were made to the building 4 discharge lines and emergency containment area to prevent future spills. A concrete pad was poured on the south side of building 4.			
93694	6/19/2014	120,000 lbs	Polystyrene, water, and styrene	Building 4 concrete emergency containment area	A batch overheated in reactor 17 and the SIS discharged the batch to the building 4 concrete secondary containment area.	SIS activation due to cooling water control valve failure.	Attempts were made to cool reactor temperature. The SIS discharge procedure was followed. The cooling water control valve was repaired.	D Construction was hired to clean the material out of the containment area.	FHRPRU004167-FHRPRU004182	N/A
123688	5/3/2016; 5/4/2016	120,000 lbs	Polystyrene, water, and styrene	Building 4 concrete emergency containment area	A batch overheated in reactor 18 and the SIS discharged the batch to the building 4 concrete secondary containment area.	Batch was unknowingly reacting at a low rate.	Procedures around loss of steam and response to a delayed batch were updated, and knowledge was shared around the potential exothermic reactions between monomer and catalysts.	D Construction was hired to clean the material out of the containment area.	FHRPRU004289-FHRPRU004289	N/A
124607	5/14/2016	120,000 lbs	Polystyrene, water, and styrene	Building 4 concrete emergency containment area	A batch overheated in reactor 15 and the SIS discharged the batch to the building 4 concrete secondary containment area.	Reactor 15 caked up during heat up to react.	Attempts were made to recover batch suspension and stabilize reactor temperature but were unsuccessful. The SIS was activated.	D Construction was hired to clean the material out of the containment area.	FHRPRU004288-FHRPRU004288	N/A
126534	7/12/2016	120,000 lbs	Polystyrene, water, and styrene	Building 4 concrete emergency containment area	A batch overheated in reactor 18 after power was lost on the reactor 18 agitator and the SIS discharged the batch to the building 4 concrete secondary containment area.	Agitator shaft broke inside the reactor resulting in a loss of effective cooling.	The agitator shaft was replaced in the reactor.	D Construction was hired to clean the material out of the containment area.	FHRPRU004290-FHRPRU004290	N/A
131449	10/29/2016	120,000 lbs	Polystyrene, water, and styrene	Building 4 concrete emergency containment area	A batch overheated in reactor 16 and the SIS discharged the batch to the building 4 concrete secondary containment area.	A DCS programming error resulted in holding reactor with monomer and catalyst for extended period of time.	A more in-depth description of reaction kinetics was created for operations. FHR ensured both DCS trained engineers are trained in testing.	D Construction was hired to clean the material out of the containment area.	FHRPRU004293-FHRPRU004297	N/A
139478	4/3/2017	120,000 lbs	Polystyrene, water, and styrene	Building 4 concrete emergency containment area	A batch overheated in reactor 15 and the SIS discharged the batch to the building 4 concrete secondary containment area.	A higher initiator and conversion rate led to the temperature increase.	Procedure was adjusted to account for quantifying maximum allowable delay after catalyst addition.	D Construction was hired to clean the material out of the containment area.	FHRPRU004299-FHRPRU004299	N/A
148114	10/20/2017	120,000 lbs	Polystyrene, water, and styrene	Building 4 concrete emergency containment area	Due to an agitator motor failure, the SIS discharged reactor 18's batch to the building 4 concrete secondary containment area.	Motor failure.	FHR replaced Reactor 18's agitator motor with a new motor. FHR enhanced protocol for installation of new and rebuilt motors to minimize the potential for premature motor failure.	D Construction was hired to clean the material out of the containment area.	FHRPRU004303-FHRPRU004352	Yes

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155058	5/4/2018	120,000 lbs	Polystyrene, water, and styrene	Building 4 concrete emergency containment area	A batch was discharged into the emergency containment area after a leak was discovered on the bottom isolation valve. The valve had an incompatible gasket type that had been installed.	Incompatible gasket installed on R16 bottom isolation valve.	The correct gasket has been installed.	D Construction was hired to clean the material out of the containment area.	FHRPRU004357-FHRPRU004406	Yes
156788	7/11/2018	120,000 lbs	Polystyrene, water, and styrene	Building 4 concrete emergency containment area	A batch overheated in reactor 17 due to the loss of cooling water flow and the SIS discharged the batch to the building 4 concrete secondary containment area.	SIS activation due to loss of cooling water flow.	Attempts were made regain cooling water flow but were unsuccessful. The SIS discharge procedure was followed. Provided training and communication to operations around key parameters of the closed loop system.	D Construction was hired to clean the material out of the containment area.	FHRPRU004407-FHRPRU004411	N/A